Dräger medical

A Dräger and Siemens Company

NARKOMED 6000 SERIES

QUICK REFERENCE GUIDE

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GETTING STARTED

As you prepare to use the Narkomed 6000 Series anesthesia workstation for the first time, you will recognize some familiar features of traditional Narkomed anesthesia machines, and some obvious differences. The Narkomed 6000 Series system represents an evolution in anesthesia workstation technology that combines a number of new advances in ventilation and electronic monitoring with proven, reliable gas delivery. Just as Draeger Medical, Inc. (DMI) set the standard years ago for safe anesthesia delivery, the Narkomed 6000 Series system sets a new benchmark in anesthesia workstation design.

The following are brief responses to some typical questions of first time users that you should take the opportunity to review. With just a few minutes of preparation, you will find the Narkomed 6000 Series system to be a flexible, convenient, and easy-to-use workstation. As you gain experience, you will soon discover capabilities that surpass those offered by previous anesthesia machines.

- How do I check-out the machine? The elements of the standard anesthesia machine checkout have not changed for the Narkomed 6000 Series system, although some of the individual steps have been automated. The automated checkout begins when the machine is turned on and requires some user interaction. Between cases, the automated Leak and Compliance Test and the manual Total Breathing System Leak Test should be performed to assist with leak checking and set the appropriate system compliance values. (Refer to page 11 of this guide.)

- How do I deliver fresh gas and anesthetic vapor? The gas delivery system has not been changed substantially on the Narkomed 6000 Series system. Both the vaporizers and flowmeters can be used in traditional fashion. Both two vaporizer and three vaporizer mounting systems are available for the Narkomed 6000 Series system. When using a two vaporizer system, move the vaporizer selector lever toward the vaporizer you wish to exclude. If a third vaporizer is mounted, the selector lever is moved upward, toward the third vaporizer position. (Refer to Section 2 of the Narkomed 6000 or 6400 Operator's Instruction Manual.)

- What monitoring capabilities are available on the Narkomed 6000 Series system? The Narkomed 6000 Series system includes expired volume, airway pressure, inspired and expired anesthetic agent, inspired oxygen concentration, and capnography as standard monitoring modalities. The data from these sensors has been integrated into a single display with touch screen capabilities that allow the user to control the monitoring functions. For users of the Integrated Patient Monitor (IPM), all of the physiologic monitoring capabilities are accessible via the touch screen. (For details on managing alarms and monitoring functions, refer to pages 42 & 43 of this guide and Sections 4 & 5 of the Narkomed 6000 or 6400 Operator's Instruction Manual.)

- How do I ventilate the patient manually? The ventilator must be in MANUAL MODE to ventilate manually. Once in this mode, the APL (popoff) valve is used to select either spontaneous or manual (assisted) ventilation. In the Spont position, there is no resistance in the APL valve and the patient can breathe spontaneously. No pressure can be developed in the breathing circuit. In the Man position, the APL valve can be set to control the maximum pressure that will be achieved by squeezing the bag. This design is provided as a convenience to avoid the need for frequent adjustment of the APL valve during assisted ventilation. (Refer to page 32 of this guide.)

- How do I turn on the ventilator? When the main power to the Narkomed 6000 Series system is turned on, the ventilator guides the user through the self-test process and then enters VENTILATOR STANDBY mode. It is important to note that in VENTILATOR STANDBY, the breathing circuit is always open to the scavenger and manual ventilation is not possible. The manual selector lever for manual (bag) ventilation or mechanical (auto) ventilation present on a conventional anesthesia machine is not present on the 6000 Series system. To select between manual and mechanical ventilation, the user must press the button for the desired mode on the ventilator control panel and press the rotary knob to confirm. (Refer to pages 32-39 of this guide.)

- How do I adjust the ventilator? The Narkomed 6000 Series system ventilator is controlled through an easy-to-use interface. Buttons are provided to select operating modes and appropriate settings. A rotary knob is used to change the selected settings. All changes to the ventilator must be confirmed by pressing the rotary knob. If the change is not confirmed, the ventilator will continue to function unchanged. (Refer to pages 32-39 of this guide.)

- Why does the reservoir bag inflate and deflate during mechanical ventilation? The movement of the reservoir bag during mechanical ventilation is due to the fresh gas decoupling feature of the Narkomed 6000 Series ventilator. During the inspiratory phase, a valve directs fresh gas into the reservoir bag and prevents fresh gas from entering the breathing circuit. As a result, fresh gas flow does not influence delivered tidal volume as it would on a traditional anesthesia machine. The reservoir bag will, however, inflate during mechanical ventilation. During the expiratory phase, the piston retracts in preparation for the next breath and the piston chamber fills with both exhaled gas and fresh gas from the reservoir bag and fresh gas flow. The reservoir bag will therefore deflate during exhalation.

- Where is the ventilator bellows? The Narkomed 6000 Series system ventilator replaces the bellows with an electronically driven piston which improves the accuracy of tidal volume delivery. A visual indication of piston movement is provided on the ventilator control panel in the form of a lighted display which indicates the piston excursion. A complete excursion of the piston is indicated by movement of the lighted bar graph to the far right of the display (100%). Indications of disconnects can be detected through the airway pressure monitor which is always active during mechanical ventilation. Capnography and volume monitoring are also provided as standard features.

- What happens in the case of an electrical failure? The Narkomed 6000 Series system is designed to support manual ventilation as well as fresh gas and anesthetic vapor delivery even in the event of a total electrical failure. Just like the design of a traditional Narkomed anesthesia machine, as long as the main power switch is in the ON position, manual ventilation as well as fresh gas and anesthetic vapor delivery are available. (Refer to pages 28-30 of this guide on emergency scenarios.)

Note: This handbook is not to be used in lieu of the Narkomed 6000 or 6400 Operator's Instruction Manual which has been provided with your machine. The topics presented in this handbook make reference to the appropriate sections of the manual where complete instructions, cautions, and warnings can also be found. Any person involved with the operation or setup of the Narkomed 6000 Series Anesthesia System must be thoroughly familiar with the Narkomed 6000 or 6400 Operator's Instruction Manual.

If you should require further assistance,
please contact DrägerService at 1-800-543-5047.

General Warnings And Cautions

The Operator's Instruction Manual contains warning and caution statements about the Narkomed 6000 Series Anesthesia System (referred to as "system" below). WARNING statements give important information that, if ignored, could lead directly to patient or operator injury. CAUTION statements give important information that, if ignored, could lead directly to equipment damage, and, indirectly, to patient injury.

WARNING: Any person involved with the setup, installation, operation, or maintenance of this system must be thoroughly familiar with the Operator's Instruction Manual. This Quick Reference Guide or the Operator's Instruction Manual, however, do not supercede established medical procedures for patient care.

WARNING: No third-party components shall be attached to this system (with certain Draeger Medical-approved exceptions).

WARNING: This system must only be serviced by an authorized representative of Draeger Medical/DrägerService.

WARNING: A test for leakage current must be performed by qualified biomedical engineering personnel before interfacing with other equipment.

WARNING: A pre-use checkout procedure should be performed immediately before system use. A recommended procedure is provided in the Operator's Instruction Manual.

WARNING: To avoid electrical shock hazard, do not remove component covers and use only hospital-grade grounded electrical outlets and power cord. External equipment must be approved by DMI and have proper grounding before connection to this system. Disconnect power supply before cleaning.

WARNING: For patient safety:

- This system must be used by, or on the order of, a physician.
- Constant attention by a qualified professional is required whenever a patient is connected to the system.
- Ensure that alarms are active and limits are set while monitoring a patient. Do not rely exclusively on audible alarms. Adjusting alarm volume to a low level requires more operator vigilance.
- If the accuracy of any data displayed on the monitor is in doubt, assess patient's vital signs by alternate means before verifying that the monitor is working correctly.
- If the display loses patient data, it is possible that active monitoring is not being performed. Close patient observation or alternate monitoring devices should be used until monitor function is restored.

WARNING: Ventilation is not possible while in VENTILATOR STANDBY mode. Never change to VENTILATOR STANDBY with a patient attached.

WARNING: If fluids drain into the system, remove the system from service until properly cleaned.

CAUTION: Although designed to minimize the effects of ambient radio-frequency interference, this system may be adversely affected by the operation of electrosurgical equipment or short wave / microwave diathermy equipment in the vicinity.

CAUTION: Do not place more than 100 lbs. on top of the system.

CAUTION: Do not place more than 30 lbs. on the work surface.

MACHINE CHECKOUT

DAILY CHECKOUT

(To be performed at the start of each day)

The following is a reminder list to facilitate the daily checkout. Details are provided in the Operator's Instruction Manual.

- ☐ **Verify that equipment is connected to a live, grounded outlet.**
- ☐ **Verify that backup ventilation equipment is available and functional.**
- ☐ **Verify pressure in the cylinders (O_2, air > 1000 psi, N_2O > 600 psi) and pipeline supplies (50-55 psi).**
- ☐ **Verify proper functioning of breathing system and patient circuit.**
  - ☐ Check for accumulation of moisture in all hoses and disconnect to drain any significant moisture.
  - ☐ Check for secure connections of all hoses, fresh gas, pressure sensor, oxygen sensor, and flow sensor.
  - ☐ Verify that patient sample line is securely connected at both ends and is free of kinks and accumulated moisture. Check water trap and empty if full.
  - ☐ Verify that absorber is filled with fresh, useable absorbent.
- ☐ **Turn on anesthesia system main switch and all other necessary electrical equipment.**
- ☐ **Perform system and ventilator self-test (up to 5 minutes in duration).**
  - ☐ Verify that *"Self-test"* appears on ventilator alphanumeric display.
  - ☐ When ventilator displays *"Fresh Gas Off?"*, close all flow control valves and press rotary knob to confirm.
  - ☐ When ventilator displays *"APL=30cmH_2O?"*, verify that APL valve is set to Man and the value is set to 30 cmH_2O, and press rotary knob to confirm.
  - ☐ When ventilator displays *"Y-piece open?"*, verify that Y-piece is attached to the breathing hoses with the end open to atmosphere, and press rotary knob to confirm.
  - ☐ When ventilator displays *"Y-piece occluded?"*, fit patient end of Y-piece to the plug on the bag mount arm, and press rotary knob to confirm.

  NOTE: After this step, the ventilator will complete the automated self-test and no further user interaction is normally required. This is a good opportunity to complete other case preparation activities.

- ☐ When ventilator displays *"Leak=____ml/min"*, verify that leakage rate is acceptable. For moderate leaks (175-350 ml/min), the option is given to accept the leak or eliminate the leak and repeat the test. Under normal conditions, leakage should not exceed 175 ml/min.
- ☐ Verify that ventilator automatically switches to VENTILATOR STANDBY mode after completion.
- ☐ Verify that self-diagnostic tests are complete and *"SYSTEM FUNCTIONAL"* appears on the monitor display. If a non-essential component to the system's operation (i.e., battery backup) fails, *"SYSTEM CONDITIONALLY FUNCTIONAL"* will appear on the monitor display. If it is deemed acceptable to proceed, touch the display box to continue.

☐ **Verify proper flow through circuit and verify APL valve function.**

- ☐ Place a spare reservoir bag on the end of the breathing circuit, set the ventilator to Manual/Spontaneous mode, and set the APL valve to 30 cmH_2O.
- ☐ Press the [Press Gauge] buttom for display.
- ☐ Turn on fresh gas and ensure ability to ventilage the spare bag easily.
- ☐ As the reservoir bag fills with gas, verify that pressure does not exceed 30 cmH_2O.
- ☐ Set the APL valve to Spont position and verify that pressure cannot be developed in the circuit.

☐ **Calibrate oxygen sensor.**

- ☐ Remove oxygen sensor from inspiratory valve dome, replace with plug, and expose sensor to ambient air for two minutes.
- ☐ Press the [O_2 Cal] button on the monitor display and confirm.
- ☐ When 21% oxygen is reported, remove plug and replace with oxygen sensor.

☐ **Verify that fill and drain valves are closed and that there is sufficient anesthetic in vaporizers.**

☐ **Verify proper functioning of flowmeters, oxygen flush, minimum oxygen flow, and oxygen ratio controls.**

- ☐ Turn on oxygen and nitrous oxide flow and verify that flowmeters adjust smoothly.
- ☐ Turn off oxygen flow and verify that nitrous oxide flow returns to zero.
- ☐ Turn off nitrous oxide flowmeter.
- ☐ Press oxygen flush button and verify proper function.

- ☐ **Verify gas scavenging system is connected and functional. With the open reservoir scavenger, adjust flow so that indicator float is mid-way between the sight-glass lines.**
- ☐ **Verify suction is available and functional.**
- ☐ **Verify all monitor alarm limits.**
- ☐ **Verify final status of machine.**
  - ☐ All vaporizers off. All flowmeter valves closed.
  - ☐ Set the APL valve to Man and the value to 10 cmH_2O.
  - ☐ Ventilator in VENTILATOR STANDBY mode.

Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 7

PRE-USE TESTING

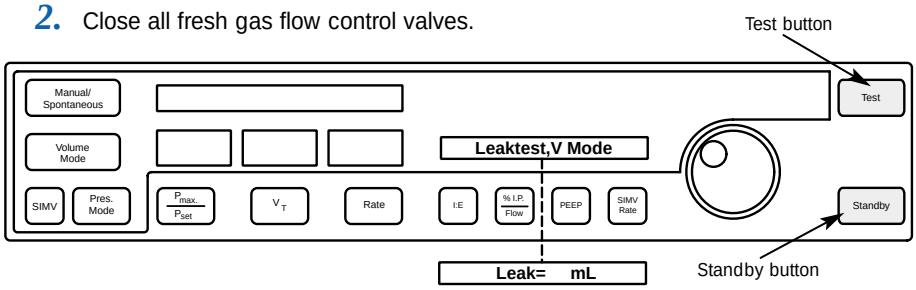
(To be completed prior to each use)

Pre-Use Leak and Compliance Test

The Leak and Compliance Test measures the compliance of the system and patient circuit and will measure and report system leakage at 30 cm H_2O. The compliance measurement is used to compensate for circuit and patient compliance changes to ensure accurate delivery of preset tidal volumes and accurate monitoring of expiratory volume. The leak measurement determines the leak rate and attempts to identify the subsystem in which the leakage is occurring. (Refer to page 13 of this guide.)

This test is performed automatically during the Ventilator Self-Test and can be initiated on-demand by placing the ventilator in STANDBY mode and pressing the [**Test**] button on the ventilator control panel until the LED on the button stops flashing. This test will take less than one minute to complete. A Leak and Compliance test should be performed between cases and whenever breathing system components are disassembled, reassembled, or changed on the machine. To initiate the test:

1. Select the [**Standby**] button on the ventilator control panel and confirm selection by pressing rotary knob.
2. Close all fresh gas flow control valves.



3. Fit the patient connection of the Y-piece to the 15 mm plug on the bag mount arm.
4. Select and hold the [**Test**] button on the ventilator control panel until the indicator light on the button stops flashing.
5. As the test progresses, the ventilator will display the message *"Leaktest, V Mode"* and then *"Compliance Test"*.
6. At the completion of the Ventilator Self-Test, the ventilator will display the message *"Leak=__ml/min"* and will automatically switch to VENTILATOR STANDBY mode. Leaks up to 175 ml/min will be accepted automatically. Leaks from 175 to 350 ml/min must be confirmed by the user. If the leak exceeds 350 ml/min, the source of the leak should be identified and rectified, and the leak test should be run again.

NOTE: The leak and compliance test should not be performed while a patient is attached to the machine.

Total Breathing System Leak Test

This test is needed to detect any significant leaks in the reservoir bag, its hose, and the fresh gas circuit and vaporizers, since only the ventilation system is tested in the Leak and Compliance Test. This test is particularly recommended after changing or filling vaporizers.

To perform the total system leak test:

1. Verify that all fresh gas flow control valves are closed. Only the minimum oxygen flow of less than 200 ml/min should be present.
2. Verify that the patient Y-piece is occluded.
3. Set the APL valve to Man and the value to 50 cmH_2O.
4. Set the Divan ventilator to Manual/Spontaneous mode.
5. On the main screen task bar on the Narkomed 6000 Series monitor screen, press [**Press Gauge**].
6. Use the oxygen flush button to pressurize the system to approximately 30 cmH_2O. If the pressure is significantly above 30 cmH_2O, pull up on the top of the APL valve or tap the APL valve toggle (depending on the type of APL valve) to relieve pressure.

   If the Pressure Gauge stabilizes above 30 cmH_2O, the total leakage of Subsystems 1, 2, and 3 is less than the minimum oxygen flow. Subsystem 3 leakage is less than the difference between the minimum oxygen flow and the leak rate reported during the Leak and Compliance Test.
7. If the Pressure Gauge stabilizes below 30 cmH_2O, increase the oxygen flow until the pressure stabilizes at close to 30 cmH_2O. Subsystem 3 leakage is approximately the difference between the oxygen flow and the leak rate reported during the Leak and Compliance Test.
8. One at a time, turn on each mounted vaporizer and repeat the previous two steps (steps 6 and 7).
9. Close all vaporizers, close the oxygen flow control valve, and return the Divan ventilator to VENTILATOR STANDBY mode.

Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 7

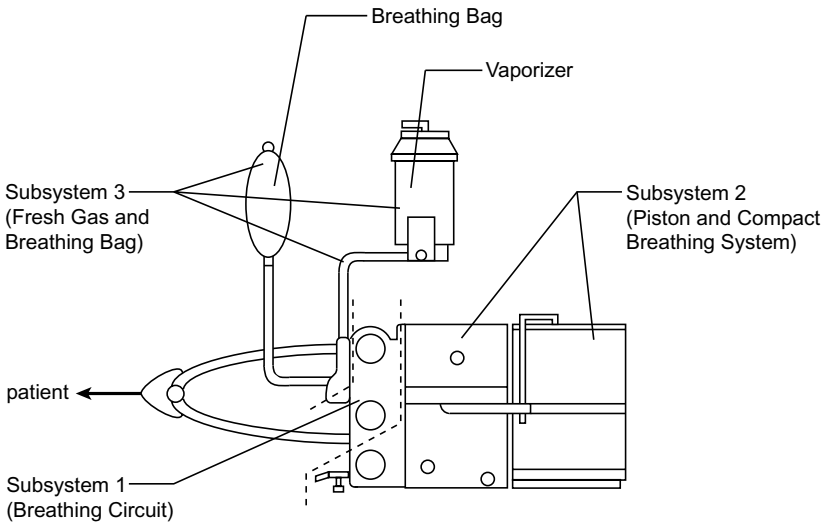
TROUBLESHOOTING THE LEAK TESTS

The ventilator self-test will identify a variety of error conditions and will indicate the condition to the user via a message on the ventilator control panel. The most common problems identified during the self-test process are those related to leaks. During the daily checkout, the ventilator self-test will report the presence of leaks and attempt to identify the subsystem in which the leakage is occurring.

The Narkomed 6000 Series ventilator is designed to detect significant leak conditions even during mechanical ventilation. This is accomplished by extending the inspiratory cycle by 1.3 seconds and measuring the resulting pressure. Any large leakage in the system will be detected and reported to the user.

Common causes of failure to complete the leak test successfully are:

- Leaks in the breathing circuit or disconnection of circuit components
- CO_2 canister not seated properly
- Flow sensor not secured or improperly mounted
- Gas sampling line cracked or disconnected



If a Subsystem 1 leak is reported, check the following in sequential order:

- Patient hoses and Y-piece are tightly connected and not leaking.
- Ensure that the ultrasonic flow sensor is tightly secured to the expiratory outlet. The cable to the flow sensor should be above the sensor lock bar, not trapped underneath it.
- Remove the ultrasonic flow sensor assembly and connect the breathing hose directly to the breathing system to check for flow sensor leakage.
- Tighten the inspiratory valve dome. Remove the 0_2 sensor assembly and insert the plug to check for leaks in the O_2 sensor.
- Ensure that the airway pressure sensor hose is connected properly at the breathing circuit and interface panel.
- Verify that the gas sampling line connections are tight and free of cracks or damage.

If a Subsystem 2 leak is reported, check the following in sequential order:

- Remove the absorber canister and verify that the lip of the canister and mating surface on the breathing system are free of dust and granules.
- Ensure that the expiratory valve dome is screwed tightly onto the expiratory valve.
- Visually inspect the gaskets and diaphragm valves within the compact breathing system and piston assembly for possible leaks or damage.

If a Subsystem 3 leak is reported, check the following in sequential order:

- Verify that the fresh gas hose, breathing bag, and breathing bag hose are secured tightly and are leak free.
- Verify that the vaporizer fill and drain ports are tight and that the vaporizers are securely mounted.

If the leak detected during the manual Total Breathing System Leak Test is excessive, check the following:

- Ensure that the APL valve is tightly secured to the breathing system and is set to Man position at 50 cmH_2O.
- Verify that the fresh gas hose, breathing bag, and breathing bag hose are secured tightly and are leak-free.
- Verify that the vaporizer fill and drain ports are tight and that the vaporizers are securely mounted.

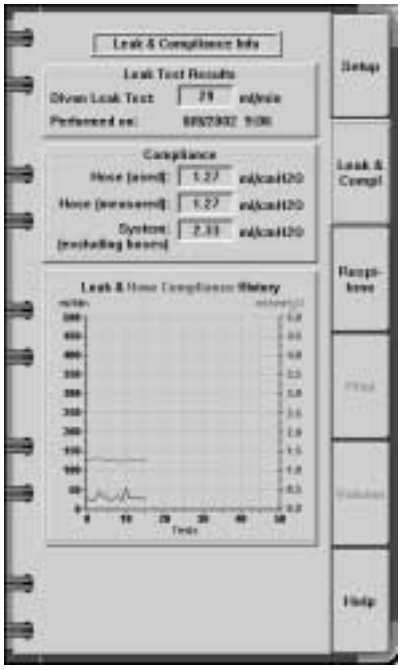
DOCUMENTING THE LEAK AND COMPLIANCE TEST: THE VENT INFO NOTEBOOK SELECTION

The [Vent Info Notebook] selection is one of the control buttons found on the secondary taskbar located at the bottom of the main display. This key displays the Ventilator Information notebook, which includes the following information (refer to figures on the next page):

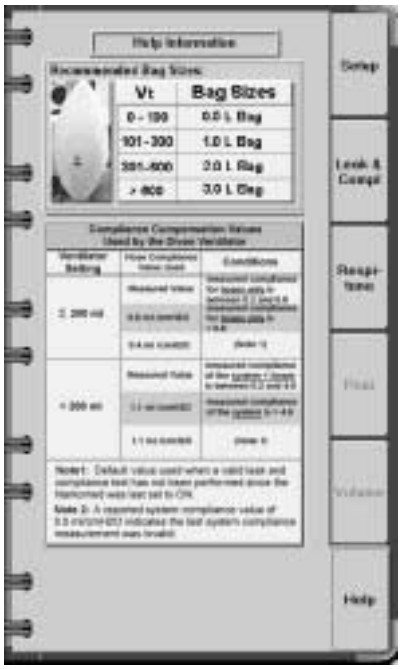
- Documentation of the most recent leak and compliance test: the total leak measured and the date and time of the last test are indicated.
- Compliance compensation information: the compliance of the breathing system is reported as the compliance of the breathing circuit hoses and the system or the internal gas pathways. On the Narkomed 6400, hose compliance is also reported as the compliance value used by the ventilator and the compliance value measured by the ventilator during the self-test. These two compliance values will be identical unless the measured compliance exceeds the compliance compensation limit in which case a default value for compliance compensation will appear in the Hose (used) box.

  Note that if the hose compliance value used by the ventilator is significantly less than the value measured by the ventilator, the patient will receive less than the set tidal volume. Draeger Medical recommends the use of breathing circuits with compliance values that are within the limits of compliance compensation. The limits of compliance compensation are defined by the selected tidal volume and can be obtained by pressing the Help tab on the Vent Info notebook.
- The leak and hose compliance measurements for the last 50 self-tests are displayed graphically.

Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 3



Leak and Compliance Page in Ventilator Information Notebook (Narkomed 6400)



Help Page in Ventilator Information Notebook (Narkomed 6400)

Note: The information displayed on the Narkomed 6000 may differ from the Narkomed 6400

SYSTEM OPERATION

INTRODUCTION

This section contains operational information for the Narkomed 6000 Series anesthesia machine. It describes basic controls, special features, CO_2 absorbent replacement, and emergency procedures.

SYSTEM CONTROLS

The Narkomed 6000 Series has a number of controls that are identical to prior Narkomed machines as well as some new controls. The following is a synopsis of how to use the basic system controls.

Main Power Switch – This switch is located on the front left of the machine just below the flowmeters. When the switch is moved to the ON position, the machine will enter the self-test process and gases will be available to the flowmeters. In the STANDBY position, no electrical power or gas flow will be available.

Flowmeters – Gas flows are adjusted in conventional fashion by turning the flow control knobs. On the Narkomed 6400 model, gas flows are measured and recorded internally in the data log and are available for export to an information system. The Air-Only Mode Option is available for those customers who wish to be able to eliminate the minimum oxygen flow.

Vaporizers – Conventional vaporizers are selected by moving the selector lever towards the vaporizer you wish to exclude. If the three vaporizer option is installed, the upper vaporizer is selected by moving the lever upwards toward the third vaporizer. Vapor concentrations are set by adjusting the concentration selection dial.

Ventilator controls – All ventilator controls are on the front panel of the lower part of the machine. Every change in ventilator function must be confirmed by pressing the selector knob. Changes in ventilator settings can be made by pressing the button for the parameter to change, rotating the selector knob until the desired value is displayed, and then pressing the selector knob to confirm the change.

Monitor controls – The large color screen is a touch screen interface for setting alarms and adjusting monitoring functions. Each parameter is selected by touching the associated parameter box.

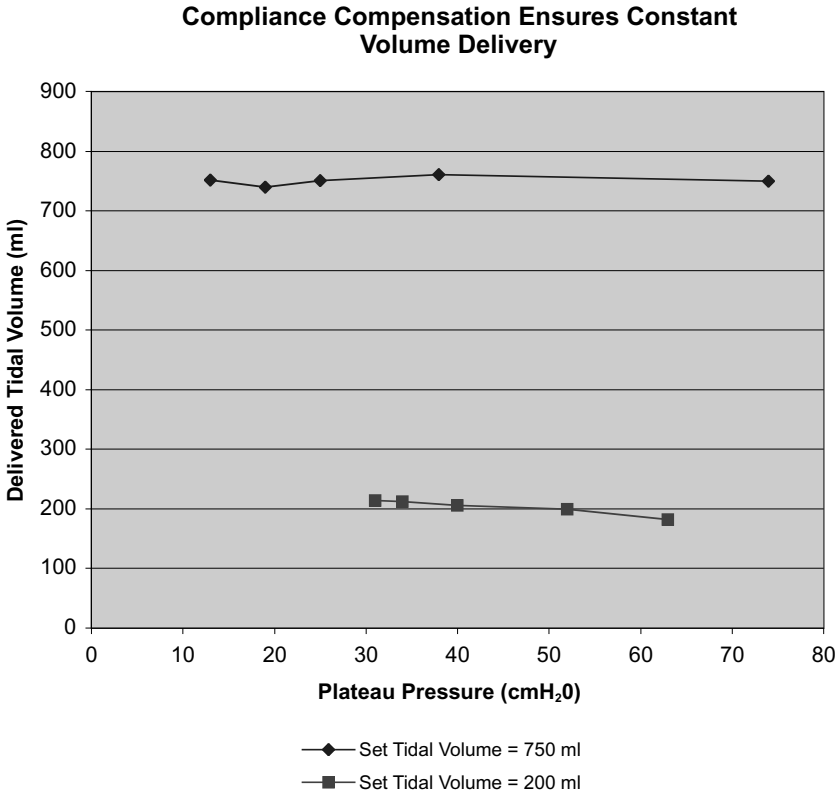
COMPLIANCE COMPENSATION

The ventilator automatically corrects for the effects of system, patient circuit, and lung compliance to maintain a constant tidal volume delivery to the patient. Compliance compensation is always active when using volume controlled ventilation.

System and patient circuit compliance are determined during the Leak and Compliance Test. (Refer to page 11 of this guide.) The ventilator uses compliance information to adjust the tidal volume delivered by the piston so that the set tidal volume is delivered to the patient's airway. This ensures that preset tidal volumes are delivered to the patient irrespective of:

- compliance of the breathing system and absorber
- compliance of the patient circuit
- lung compliance changes

The figure below illustrates the impact of compliance compensation for adult and pediatric applications:



By minimizing loss of tidal volume due to breathing circuit compliance, ventilator performance with pediatric patients and patients with diseased lung conditions is significantly enhanced.

The monitored expiratory tidal volume is also corrected for compression losses in the breathing circuit to improve the accuracy of volume monitoring. The monitor adjusts for the volume of gas compressed in the hoses to report the actual exhaled tidal volume.

Breathing circuits must be carefully selected to ensure optimal compliance compensation. The following guidelines describe proper circuit selection for adult and pediatric patients:

- For tidal volumes <200 ml: breathing circuit (hoses) compliance must be between 0.2 and 0.8 ml/H_2O
- For tidal volumes >200 ml: total measured compliance of the breathing system (internal to the machine) and breathing circuit (hoses) should be no greater than 4.6 ml/H_2O

After completing the Leak and Compliance Test, press the [Vent Info Notebook] button and then the Leak & Compl tab to view the measured compliance values, and ensure that the circuits being used conform to the recommended compliance range.
See page 15 of this guide.

Fresh Gas Decoupling

Fresh Gas Decoupling prevents fresh gas from entering the breathing circuit during the inspiratory phase of a ventilator cycle, thereby eliminating any influence of fresh gas on delivered tidal volume.

During the inspiratory phase of mechanical ventilation, inspiratory gas flows from the piston assembly to the patient. Fresh gas is isolated from the breathing circuit during this phase and accumulates in the breathing bag. During expiration, the fresh gas flow and breathing bag are connected to the breathing circuit and mix with the expiratory gas being returned from the patient to the piston.

Note: The reservoir bag will inflate and deflate during mechanical ventilation as fresh gas flows in and out of the bag. This is the normal function of the Narkomed 6000 Series machine and does not indicate that the patient is breathing spontaneously.

This feature protects the patient from excess tidal volume being delivered and allows tidal volume delivery to be maintained irrespective of changes in fresh gas flows.

(Refer to gas circuit diagrams on page 22 of this guide)

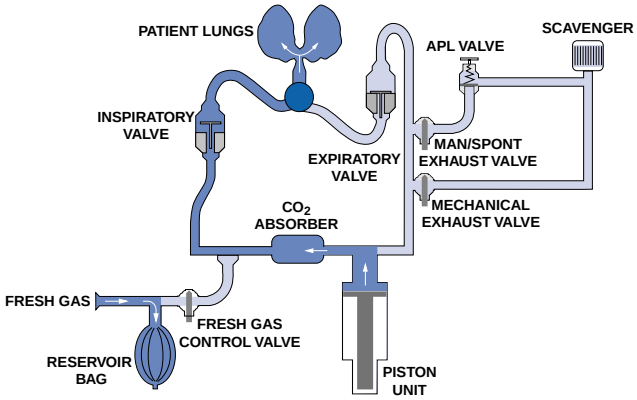
Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 2

GAS FLOW CIRCUIT

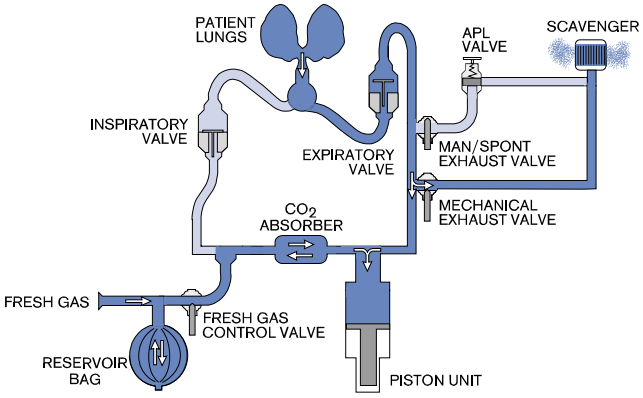
Mechanical Ventilation

During the inspiratory phase of mechanical ventilation, the fresh gas control valve closes, isolating fresh gas from the breathing circuit. Fresh gas accumulates in the breathing bag while the piston delivers the preset tidal volume plus any additional volume needed to compensate for the circuit compliance. During expiration, the fresh gas control valve opens, allowing the piston chamber to fill with both fresh and exhaled gas. Excess gas is exhausted through the scavenger.

Mechanical Inspiration



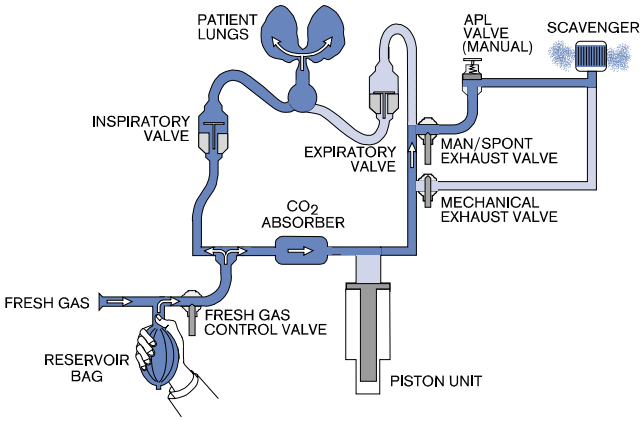
Mechanical Expiration



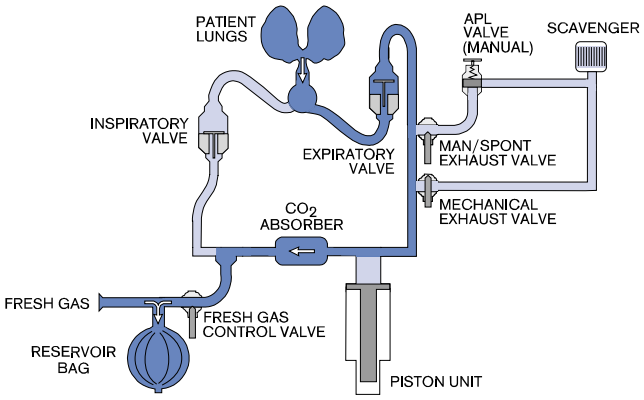
Manual Ventilation

During manual ventilation, the breathing bag is squeezed to deliver a mixture of fresh gas and rebreathed gas to the patient with excess gas being exhausted through the scavenger. During expiration, the rebreathed gas flows back to the bag.

Manual Inspiration



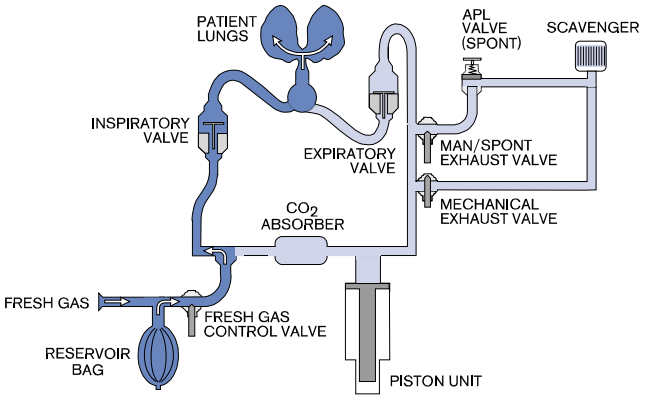
Manual Expiration



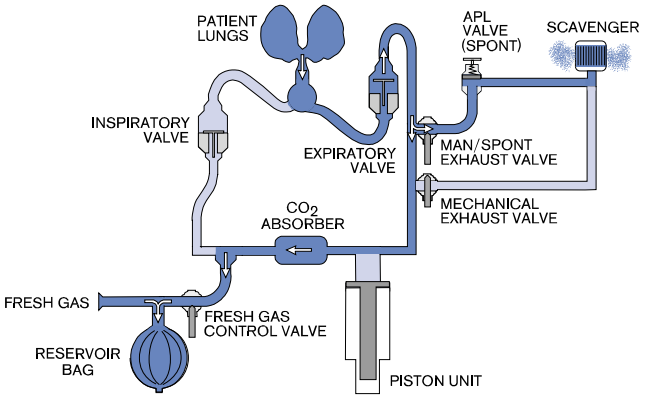
Spontaneous Ventilation

During spontaneous ventilation, the patient inhales gas from the breathing bag. During expiration, the rebreathed gas flows back to the bag with excess gas being exhausted through the scavenger.

Spontaneous Inspiration



Spontaneous Expiration



BREATHING SYSTEM WARMER

A warming plate is incorporated into the internal breathing system of the Narkomed 6000 Series machine to prevent condensation of moisture and to ensure proper functioning of valves and switches. The warmth can be noted by raising the tabletop cover and resting a hand on the flat metal surface to the left of the piston. The warmer conditions the inspired gases by adding heat and reducing the loss of humidity through condensation.

The maximum temperature of the warming plate is regulated by redundant sensors to not exceed 41°C. The actual temperature of inspired gases will vary with the total fresh gas flow, ambient temperature, and length of the breathing circuit tubing. Under typical conditions, the temperature of the inspired gases does not exceed 32°C. Note that the use of an external heater/humidifier is not recommended with the Narkomed 6000 Series machine.

STANDBY MODES

SYSTEM STANDBY – The Narkomed 6000 Series system can be placed in STANDBY by toggling the main power switch from “ON” to “STANDBY”. In STANDBY, the electrical power is still active, helping to ensure the battery is charged and the gas analyzer is ready for prompt use upon Power Up.

VENTILATOR STANDBY – The Divan Ventilator, when not in use for manual or mechanical ventilation, can be placed in VENTILATOR STANDBY by pressing the [**Standby**] button on the ventilator control panel. The ventilator can then be activated, at any time, without requiring a full self-test. During this mode, gas delivery is stopped and power consumption is minimized.

MONITOR STANDBY – The monitor can be placed in MONITOR STANDBY to temporarily suspend all monitoring activity and alarms by pressing the [**Monitor Standby**] button in the taskbar at the bottom of the main display. The ventilator must first be put into VENTILATOR STANDBY before monitoring functions can be disabled. (For details on the MONITOR STANDBY function, refer to page 42 of this guide.)

ALARM STANDBY: Individual alarms can be placed in ALARM STANDBY by touching the individual bell icons in the parameter boxes on the right side of the main display. Pressing the bell icon will toggle the status of individual alarms between ON, OFF, and STANDBY, which will be indicated by a change the appearance of the icon (see page 42 of this guide). In ALARM STANDBY, the bell icon will be colored gray and will automatically revert to ON upon valid detection of data from patient monitor sensors. Breathing pressure alarms do not support standby status and cannot be turned OFF during mechanical ventilation. Oxygen alarms are always ON and may not be turned off, unless disabled during MONITOR STANDBY.

Reference: Narkomed 6000 or 6400 Operator’s Instruction Manual – Section 2

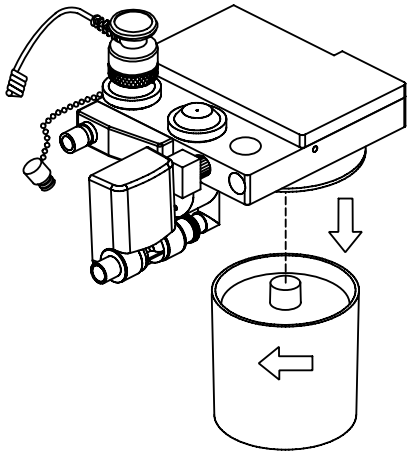
CO_2 Absorbent Replacement

The absorbent canister is located below the breathing system. Absorbent will change color in the Narkomed 6000 Series from the bottom upwards when saturated with CO_2. Absorbent should be changed when two-thirds of the absorbent has changed color or after fresh gas has been flowing continuously for over 48 hours with no patient use.

Warning: Change the absorbent if fresh gas has flowed continuously without the use of the Narkomed 6000 Series machine on patients (e.g., if machine has been left on over a weekend).

Additionally, it have been observed that excessively dry absorbent can react chemically with inhalation anesthetics (especially sevoflurane), resulting in the breakdown of the anesthetic.

To change absorbent:



1. Turn off vaporizer and fresh gas flow.
2. Press the [**Manual/Spontaneous**] button on the ventilator control panel and confirm selection by pressing rotary knob.
3. Set APL valve to Spont position.
4. Turn absorbent canister clockwise until it disconnects from the ventilator.
5. Empty contents into an appropriate refuse container.
6. Check canister to ensure that it is not chipped or cracked and that the screen at the bottom is still in place.
7. Add new absorbent to the canister. Do not exceed the maximum fill line. Be sure that the top edge of the canister is clean of any absorbent particles.
8. Replace canister and turn counterclockwise to secure.
9. If absorbent is being replaced between cases, perform a Leak and Compliance test on the ventilator to check for leaks. (Refer to page 11 of this guide for instructions.)

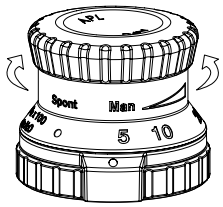
Note: The absorbent canister does not accommodate standard pre-packaged absorbent. Any form of loose-fill can be used. Contact Draeger Medical for information on Drägersorb absorbent options.

Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 8

EMERGENCY SCENARIOS: VENTILATOR SAFE-STATE

The ventilator automatically enters a Safe-State if it detects an internal fault, beyond the control of the clinician, which might otherwise affect patient safety during mechanical ventilation. This state will automatically disable mechanical ventilation. Both manual and spontaneous ventilation will be possible and both fresh gas and vaporizer settings can be adjusted. All monitoring functions and alarms will continue uninterrupted.

1. The ventilator will momentarily display the message *"Equipment Fault"* followed by a message *"Fault Nr __"* to indicate the appropriate equipment fault number.
2. A buzzer will sound continuously until silenced by pressing the rotary knob on the ventilator.
3. Set APL valve to manual position:



a) with knob-style APL valve, turn knob to Man position (index mark lined up with Man label).

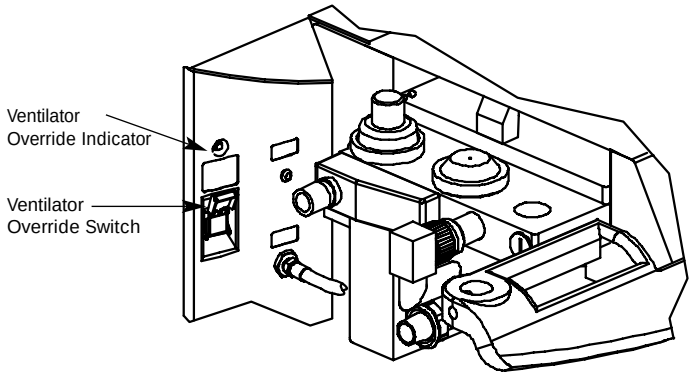
b) with toggle-style APL valve, set toggle to MAN by adjusting toggle as shown.

4. Rotate APL valve to desired pressure by referencing pressure scale markings.
5. Press oxygen flush to sufficiently inflate the breathing bag.
6. Manually ventilate the patient by squeezing the breathing bag.
7. Set flowmeters and vaporizer to desired settings.
8. Contact an authorized representative of DrägerService before attempting to reuse the ventilator.

Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 8

EMERGENCY SCENARIOS: VENTILATOR OVERRIDE SWITCH

A ventilator override switch is provided as an additional safety mechanism. This switch allows the ventilator controls to be bypassed in the unlikely event of an electronic failure which does not allow the clinician to ventilate in normal Manual/Spontaneous mode or Safe State. Activation of this switch will power down the ventilator, bypass mechanical ventilation controls, and allow for manual ventilation. Gas delivery and respiratory monitoring remain unaffected.



1. Locate Ventilator Override Switch below the flowmeter bank.
2. Depress switch until red indicator lights. The ventilator automatically switches to MANUAL/SPONTANEOUS mode and there will be no information displayed on the ventilator control panel.
3. Set APL valve to Man position.
4. Adjust APL valve to desired inspiratory plateau pressure.
5. Press oxygen flush to sufficiently inflate the breathing bag.
6. Manually ventilate the patient by squeezing the breathing bag.
7. Set flowmeters and vaporizer to desired settings.
8. Contact an authorized representative of DrägerService before attempting to reuse the ventilator.

Note: The System will need to be powered down and restarted to cancel the ventilator override condition and reactivate mechanical ventilation.

Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 8

EMERGENCY SCENARIOS: VENTILATOR EMERGENCY QUICK START

This procedure is designed to bypass the ventilator self-test in emergency situations where immediate access to mechanical ventilation is required. The Emergency Quick Start only bypasses the ventilator self-test. The Narkomed 6000 system will continue through the remaining self-diagnostic test routines and will report the final status of individual system components. The ventilator can continue to be used while the system completes its testing. An Emergency Quick Start Procedure will only be permitted up to ten times, after which a complete ventilator self-test will be required.

1. Turn on anesthesia system using main power switch.
2. Immediately press and hold down the [**Standby**] button on the ventilator control panel.
3. Ventilator will display *"x Cancel Test"* where *"x"* indicates the number of times that the ventilator self-test has been bypassed. After the self-test has been bypassed ten (10) times, the system will require that a complete self-test be performed prior to operation.
4. The system automatically switches to VENTILATOR STANDBY mode after an abbreviated self-test.
5. While system diagnostics continue, users can activate the ventilator and proceed with ventilation. Fresh gas and vapor delivery is also possible.

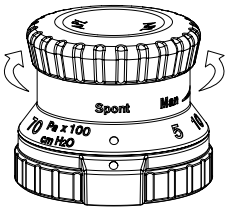
Note: The Emergency Quick Start procedure bypasses the ventilator Leak and Compliance Test and does not allow ventitation diagnostics to be completed. During volume mode, the ventilator will use the last measured compliance value to compensate for patient circuit compliance. Users should be aware that tidal volume delivery may differ from preset values under these conditions.

Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 3

VENTILATION MODES

VENTILATION MODES: MANUAL / SPONTANEOUS

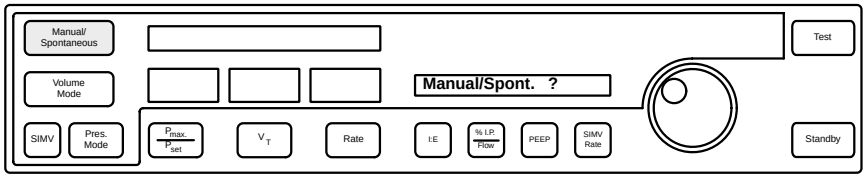
The Narkomed 6000 Series may be equipped with either the knob-style or the toggle-style APL valve. The knob or toggle is used to switch between manual and spontaneous ventilation. When the APL valve is set to the Spont position, gas entering the valve will vent through the scavenger - no pressure will be maintained in the circuit. In the Man position, the pressure indicated by the APL valve is the maximum inspiratory pressure that can be achieved when the bag is squeezed. This pressure can be adjusted by rotating the knob or toggle, as applicable.



Knob-style APL valve

Toggle-style APL valve

To enter manual / spontaneous mode:



1. Select the [**Manual/Spontaneous**] button on the ventilator control panel.
2. Confirm selection by pressing rotary knob.

3. LED will light to indicate Manual / Spontaneous mode.

For manual ventilation,

- Set APL valve to Man position.
  (knob turned to Man, or toggle set to MAN, as applicable)
- Rotate APL valve to set desired pressure by referencing pressure scale markings.

For spontaneous ventilation,

- Set APL valve to Spont position to open valve and eliminate resistance.
  (knob turned fully counterclockwise to Spont until index marks line up, or toggle set to SPONT, as applicable)
- Alternatively, the APL valve can be set to minimal pressure in Man position to minimize resistance while holding some pressure in the bag.

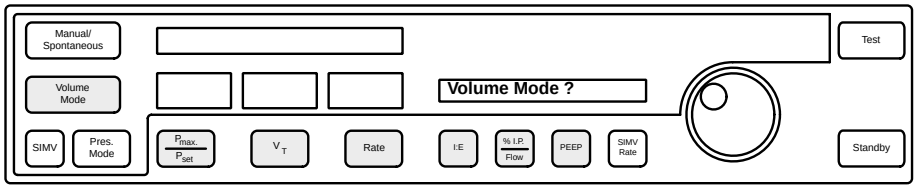
To flush contents of bag,

- Set APL valve to Spont position to flush gas in breathing bag through the scavenger.

Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 6

VENTILATION MODES: VOLUME

Volume mode is defined as a volume-limited time-cycled ventilation method which controls the tidal volume delivered during inspiration. As compared to conventional anesthesia systems, this mode has been enhanced with compliance compensation and fresh gas decoupling to ensure accurate delivery of preset tidal volumes. (Refer to pages 19-21 of this guide.) To enter this mode:



1. Select the [**Volume Mode**] button on the ventilator control panel. Do not confirm selection until parameter settings have been verified. LED will blink indicating that volume mode selection has not yet been activated.

2. To adjust current settings, press the corresponding parameter button on the ventilator control panel. Change the setting by rotating the knob to desired new value, and press knob to confirm each new setting.

   Active parameters, along with their typical operating ranges for volume ventilation, are as follows:

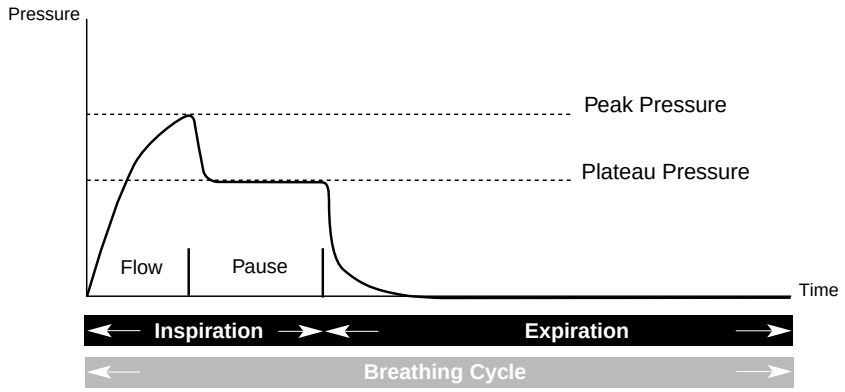
Active Parameters	Range	Factory Defaults	Site Defaults
Max. Inspiratory Pressure Limit (Pmax)	10 – 80 cmH_2O	25 cmH_2O	
Preset Tidal Volume (Vt)	10 – 1400 mL	600 mL	
Breath Rate (Rate)	6 – 80 bpm	12 bpm	
I:E ratio (I:E)	1:5 – 5:1	1:2	
Percentage Inspiratory Pause (%I.P.)	0 – 60%	10%	
Positive End Expiratory Pressure (PEEP)	0, 2 – 20 cmH_2O	0 cmH_2O	

Note: Desired tidal volumes may not be achieved if the inspiratory pressure limit is set too low.

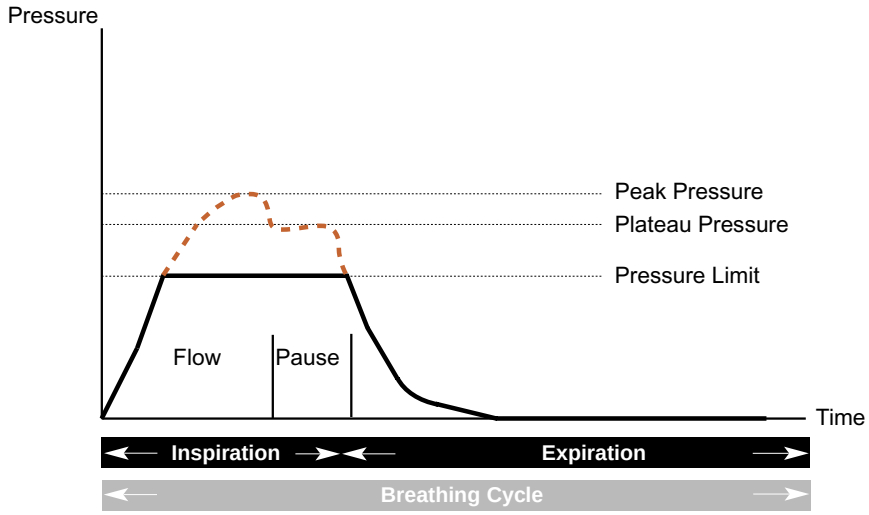
3. When all settings are adjusted, press knob to confirm mode and start volume ventilation.

Note: If volume LED is no longer lit, reselect the [**Volume Mode**] *button and confirm selection by pressing rotary knob.*

Pressure Waveform in Volume Mode



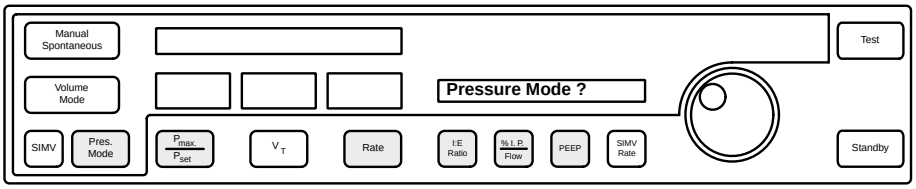
Pressure Waveform in Volume Mode: Pressure Limit Condition



Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 6

VENTILATION MODES: PRESSURE

Pressure mode is defined as a pressure-limited time-cycled ventilation method which controls the peak airway pressure being maintained during inspiration. This mode has special utility in cases where it is difficult to maintain an established tidal volume delivery due to endotracheal tube leaks or low compliant lungs. To enter this mode:



1. Select the [**Pres. Mode**] button on the ventilator control panel. Do not confirm selection until parameter settings have been verified. LED will blink indicating that pressure mode selection has not yet been activated.

2. To adjust current settings, press the corresponding parameter button on the ventilator control panel. Change the setting by rotating the knob to desired new value, and press knob to confirm each new setting.

   Active parameters, along with their typical operating ranges for pressure ventilation, are as follows:

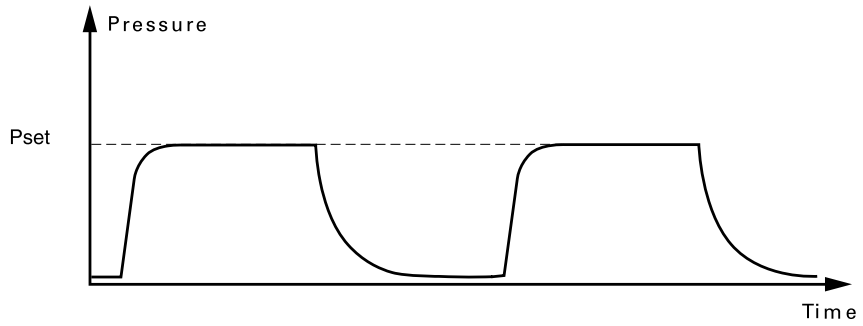
Active Parameters	Range	Factory Defaults	Site Defaults
Peak Airway Pressure Setting (Pset)	10 – 70 cmH_2O	10 cmH_2O	
Breath Rate (Rate)	6 – 80 bpm	12 bpm	
I:E ratio (I:E)	1:5 – 5:1	1:2	
Inspiratory Flow Rate (Flow)	5 – 75 L/min	50 L/min	
Positive End Expiratory Pressure (PEEP)	0, 2 – 20 cmH_2O	0 cmH_2O	

Note: Desired peak airway pressures (Pset) may not be achieved if inspiratory flow is set too low. Pset and PEEP cannot be set within 5 cmH_2O of each other.

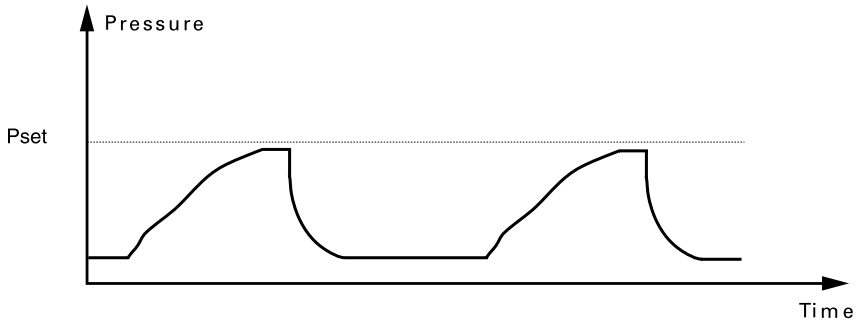
3. When all settings are adjusted, press knob to confirm mode and start pressure ventilation.

Note: If pressure LED is no longer lit, reselect the [**Pres. Mode**] *button and confirm selection by pressing rotary knob.*

Pressure Waveform in Pressure Mode



Pressure Waveform in Pressure Mode: Flow Limit Condition

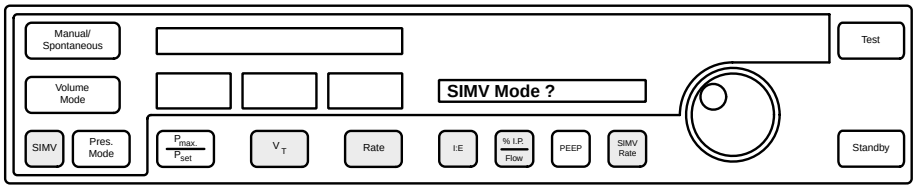


Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 6

VENTILATION MODES: SIMV

Synchronized Intermittent Mandatory Ventilation (SIMV) mode allows the patient to breathe spontaneously while synchronizing a minimum number of mechanical breaths to ensure adequate ventilation. This mode has special utility whenever a patient is breathing spontaneously under general anesthesia as a convenient means to assist ventilation.

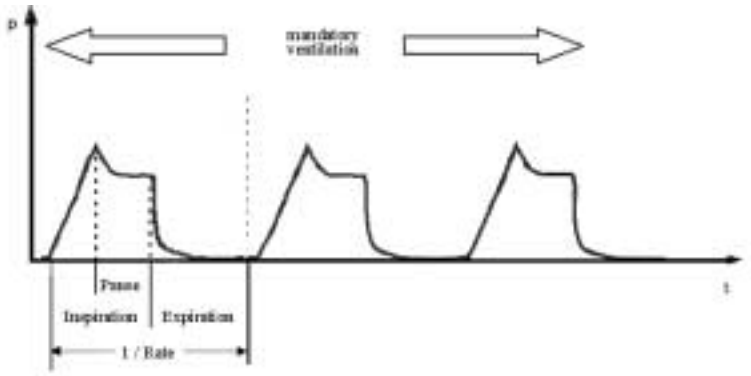
During this mode, the mechanical breaths are defined by the parameter settings used for volume ventilation (refer to page 34 of this guide), with the interval between breaths being defined by the SIMV rate. In between mechanical breaths, the patient is able to breathe spontaneously by drawing gas at ambient pressure from the reservoir bag. If the patient initiates a breath within a predefined trigger window, as detected by a negative pressure of 1 cmH_2O, the mechanical breath is synchronized to prevent the inspiratory cycle of a mandatory breath from being applied during the expiratory phase of a spontaneous breath. To enter SIMV mode:



Note: PEEP is not active in SIMV mode.

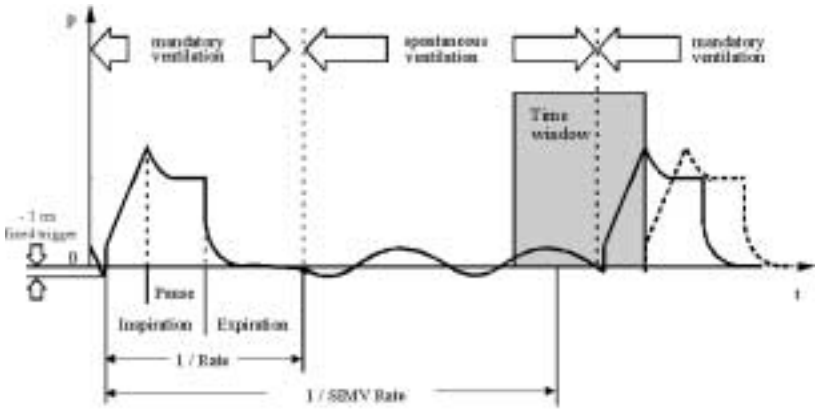
1. Select the [**SIMV**] button on the ventilator control panel. Do not confirm selection until parameter settings have been verified. LED will blink indicating that SIMV mode selection has not yet been activated.
2. Current setting for SIMV rate will be displayed in ventilator window. This parameter defines the interval between mechanical breaths.
3. To change this interval, press the [**SIMV Rate**] button on the ventilator control panel to define the number of mechanical breaths/min. Rotate knob to desired new value and press knob to confirm. This rate can vary between 3 and 80 bpm but cannot be set higher than the setting for [**Rate**].
4. To adjust other settings, press corresponding parameter buttons on the ventilator control panel. (Refer to page 34 of this guide.) Change the setting by rotating knob to desired new value, and press knob to confirm.
5. Confirm SIMV mode selection and start SIMV ventilation by pressing rotary knob. If SIMV LED is no longer lit, reselect the [**SIMV**] button and confirm selection by pressing rotary knob.
6. LED will light to indicate SIMV mode.

Pressure Waveform in Volume Mode



The waveform above is typical of volume mode ventilation using the following settings: rate= 10 bpm, I:E ratio = 1:1, tidal volume = 750ml, and inspiratory pause = 60%.

Pressure Waveform in SIMV Mode



In the waveform above, volume mode settings have not changed but the patient is now getting mechanical breaths at intervals defined by SIMV rate (4 bpm). Mechanical breaths are also being synchronized with the patient's spontaneous efforts.

Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 6

MONITORING

CONTROLLING ALARM STATUS

There are four ways to control alarm status:

ALARM SILENCE – The [**Alarm Silence**] icon in the alarm window will silence all current alarms for 60 seconds if touched once or 120 seconds if touched twice.

BELL ICONS – Most individual alarms can be changed sequentially from OFF to STANDBY to ON and then back to OFF by touching the bell icons located in the associated parameter box. The appearance of the bell icon changes when touched:

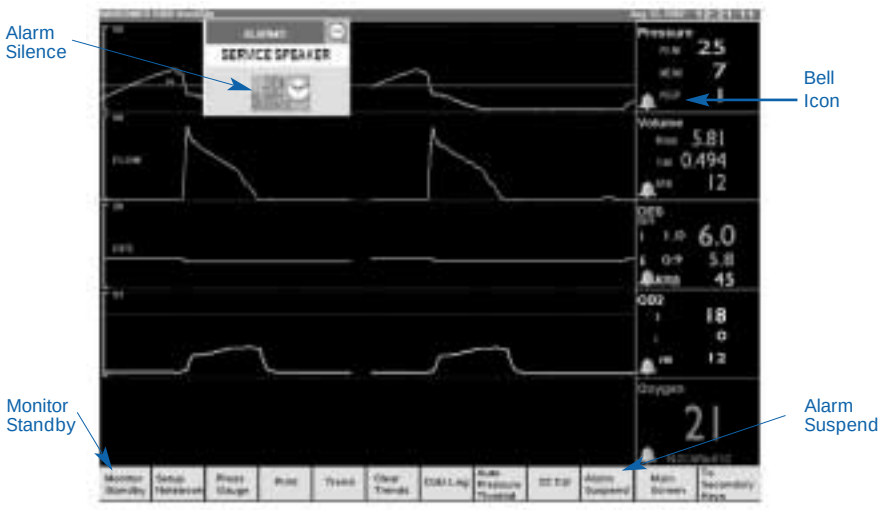
 – alarm ON (bell colored)

 – alarm OFF (bell crossed out)

 – alarm STANDBY (bell grayed out)

ALARM SUSPEND – Patient alarms can be suspended by pressing the [**Alarm Suspend**] button located in the taskbar at the bottom of the main display. When mechanical ventilation is active, breathing pressure alarms cannot be suspended. Pressing the same button, which is revised to read [**Cancel Alarm Suspend**] when alarms are suspended, will restore all patient alarms. It should be noted that patient alarms refer to patient status or parameters (apnea, et CO_2 level, etc.). Machine alarms refer to specific mechanical conditions (threshhold low, CO_2 line block, etc.) and are not affected by ALARM SUSPEND.

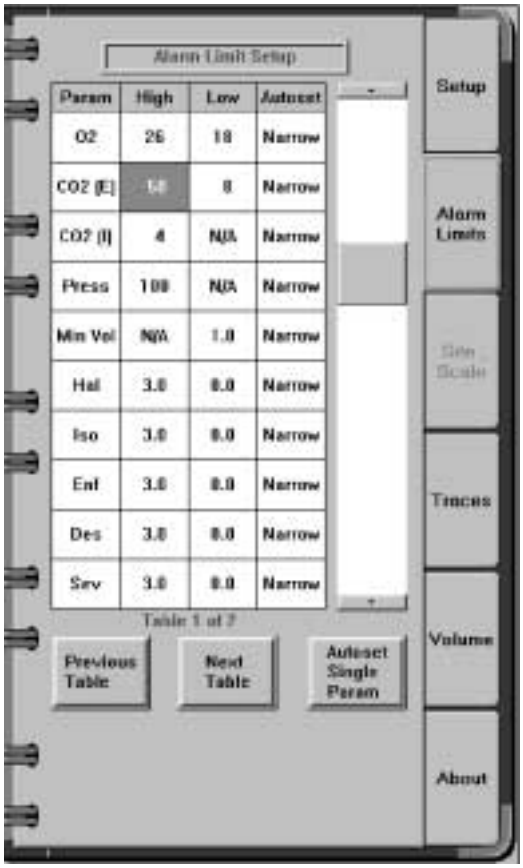
MONITOR STANDBY – All monitoring activity and alarms can be temporarily suspended by pressing the [**Monitor Standby**] button in the taskbar at the bottom of the main display. All alarms will be placed in ALARM STANDBY and all data collection activity will cease. To resume monitoring, touch anywhere on the Monitor Standby screen. A dialog box will allow you to select “Resume” to continue monitoring using previous alarm limits and trend information or to select “New Case” to clear the trend information and revert to default alarm limits. The ventilator must be in VENTILATOR STANDBY mode before monitoring functions can be disabled. Monitoring will automatically resume if the ventilator is activated.



Reference: Narkomed 6000 or 6400 Operator’s Instruction Manual – Section 3

CONTROLLING ALARM LIMITS

Alarm limits and autoset ranges can be viewed and modified easily using the system setup notebook.



- Touch the [**Setup**] button (on the Narkomed 6000) or the [**Setup Notebook**] button (on the Narkomed 6400) in the taskbar located at the bottom of the main display. The system setup notebook will appear. The active tab will default to the previously selected tab.
- If not active, touch the “Alarm Limits” tab to view the alarm limits setup page.
- Touch the desired alarm limit to select the appropriate setting.
- Use the slider bar to adjust settings. Touch the box in the slider bar to drag to desired new setting or tap the slider bar or arrow to adjust settings in coarse or fine increments.
- Touch the desired autoset range to toggle settings between wide, narrow, and off. This tells the Limits Autoset function which range to use for the selected parameter when the [**Limits Autoset**] button is selected in the secondary taskbar.
- Touch the [**Setup**] or [**Setup Notebook**] button or the [**Main Screen**] button in the taskbar to close the notebook page.

Alarm messages provide quick and easy access for clearing alarms. If the alarm has user-adjustable limits, touching the active alarm message will automatically call up the alarm limits setup page with the corresponding alarm limit highlighted. The alarm limit can immediately be modified using the slider bar as described above.

Reference: Narkomed 6000 or 6400 Operator’s Instruction Manual – Section 3

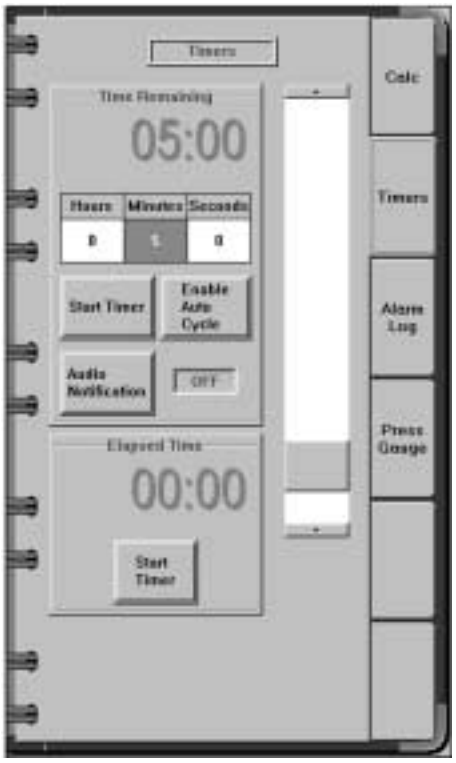
SYSTEM UTILITIES

Common utilities that are integral to the anesthesia workstation can be accessed through the [**Utilities**] button (on the Narkomed 6000) or the [**Utilities Notebook**] button (on the Narkomed 6400). A calculator, timer, alarm log, and pressure gauge are currently available. To select these utilities:

- Touch the [**To Secondary Keys**] button on the taskbar located at the bottom of the main display.
- Touch the [**Utilities**] button (Narkomed 6000) or the [**Utilities Notebook**] button (Narkomed 6400).
- Touch the corresponding tab to activate the appropriate notebook.

The calculator utilizes a standard windows design.

The timer provides countdown and elapsed time functions. To use the countdown timer function:



- Touch either hours, minutes, or seconds field to activate a slider bar which can be used to adjust timer settings. Touch the box on the slider bar to drag to desired new setting or tap the bar or arrow to adjust settings in coarse or fine increments.
- Touch the [**Start Timer**] button to initiate timer. The time remaining will be displayed on the notebook page and in the title bar of the main display.
- Touch the [**Audio Notification**] button to sound a tone when the time has expired.
- When the timer starts, the [**Start Timer**] button changes to [**Stop Timer**]. Touching this button will stop the timer.

To use the time elapsed function:

- Touch the [**Start Timer**] button in the elapsed time block. The elapsed time is displayed on the notebook page and in the title bar of the main display.
- When the timer starts, the [**Start Timer**] button changes to [**Stop Timer**]. Touching this button will stop the timer.

The pressure gauge provides a graphic, numeric, and audio indicator for improved pressure monitoring.

The graphic display provides feedback similar to traditional analog devices. The display is enhanced with numerics and audio signaling to facilitate use. Numeric values for airway pressure are continuously updated. The Peak and PEEP pressures are captured for additional feedback. The audio signal can be used to provide an audible tone to indicate when a preset pressure threshhold limit has been reached.

To use the pressure gauge function:

- Touch the [**Press Gauge**] button on the taskbar at the bottom of the main display.
- To activate the audio feature, touch the audio speaker icon on the graphic display to activate audio signaling. The number at the center of the graphic display indicates the current threshhold limit. A gray indicator line extending from the center of the graphic display corresponds with this threshhold value.
- To change the audio threshhold limit, press the arrows to make adjustments in the range of 10 to 50 cmH_2O. The default threshhold limit is 20 cmH_2O. The audio threshhold limit will only be active when the pressure gauge notebook is displayed. Standard pressure alarms will not be affected.

Reference: Narkomed 6000 or 6400 Operator's Instruction Manual – Section 3

CLINICAL APPLICATIONS

PEDIATRIC APPLICATIONS

The Divan ventilator has been specially designed to enhance ventilation performance with pediatric and neonatal patients.

- Compliance compensation ensures that preset tidal volume settings are delivered to the patient Y-piece and will not be reduced due to compliance in the hoses, filters, or other components of the patient circuit or anesthesia delivery system. Proper breathing circuit selection is essential to ensure accurate compliance compensation (see “Breathing Circuit Selection” below).
- Fresh gas decoupling ensures that there will be no interaction of fresh gas with inspired tidal volume. Fresh gas flow can be adjusted without concern for altering delivered tidal volume.
- Pressure controlled ventilation is available to limit the risk of barotrauma and to ensure more consistent tidal volume delivery when using an uncuffed endotracheal tube.
- Exhaled volume monitoring is corrected for the gas compressed in the breathing circuit for tidal volume settings < 200 ml so that actual expiratory tidal volumes are reported as low as 10 ml.
- A warmer built into the ventilator helps to maintain the warmth and humidity of the inspired gases.

BREATHING CIRCUIT SELECTION

Pediatric circuits are recommended for patients requiring small tidal volumes. Accurate compliance compensation for pediatric patients requires that the compliance of the circuit not exceed 0.8 ml/cmH_2O (see the Help Page figure on page 16 of this guide) As a reminder, the ventilator will post a query, “*Pediatric hoses?*” when tidal volume is set to less than 200 ml. If the actual circuit compliance exceeds the maximum of 0.8 ml/cmH_2O, the ventilator will substitute a value for compliance of 0.6 ml/cmH_2O to avoid the potential for excessive ventilation. However, if the circuit compliance is substantially greater than the default, the patient will not receive the set volume.

Note: A Leak and Compliance Test should be performed to establish the proper system compliance anytime that the patient circuit is changed.

Contact your local Draeger Medical Sales Representative to obtain a copy of the Clinical Practice Bulletin Series on pediatric ventilation issues.

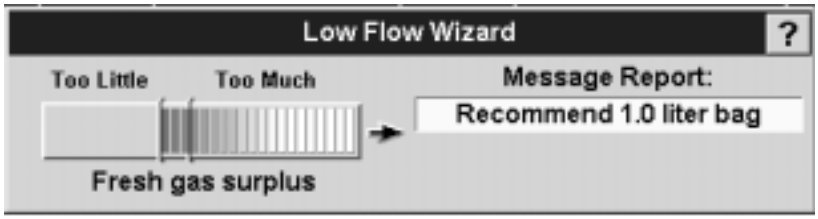
LOW FLOW APPLICATIONS

Several design features of the Divan ventilator help the user to deliver anesthesia utilizing low or minimal fresh gas flow. These design features include:

- Accurate, high resolution flowmeters to support setting precise fresh gas flows less than 1 liter/min.
- Automated tests for leakage that quantify the leak rate for the breathing system before starting the anesthetic.
- Continuous testing for leakage throughout the course of anesthetic delivery.
- Isolation of fresh gas control from tidal volume delivery makes it possible to initiate a low flow technique without requiring adjustments in tidal volume.
- A breathing system warmer which minimizes condensation of moisture within the breathing system.
- Standard integrated gas monitoring measures the actual delivered agent concentration at the patient Y-piece.
- A "*Fresh gas low*" message will be displayed to indicate inadequate fresh gas flow if the reservoir bag becomes empty.
- Available Low Flow Wizard™.

THE LOW FLOW WIZARD

The Low Flow Wizard feature is designed to guide the clinician to a minimal flow setting tailored to the needs of the individual patient (see figure below). Once an adequate depth of anesthesia has been established, fresh gas should be adjusted to keep the gas surplus indicator between the two boundary lines. Arrows on the wizard display will indicate whether the gas surplus is increasing or decreasing whenever a change in gas flow is made. Note that the wizard only assesses the fresh gas surplus. Anesthetic agent and inspired oxygen monitoring are essential to ensure adequate depth of anesthesia and adequate oxygen delivery.



Contact your local Draeger Medical Sales Representative to obtain a copy of the Clinical Practice Bulletin Series on low flow issues.

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